

## CLAIMS

What is claimed is:

1. A data-flow and context-flow data processing system comprising a plurality of data driven cores capable of switching between a plurality of contexts, wherein the plurality of data driven cores comprises a plurality of distributed multi-context storage units each capable of storing a plurality of context parameters corresponding to the plurality of contexts, each multi-context storage unit comprising:

a) a context register bank comprising

a plurality of context parameter registers for storing the plurality of context parameters, each context parameter register storing a parameter for one of the contexts, the plurality of context parameter registers having a corresponding plurality of inputs connected to an input connection, and a corresponding plurality of outputs; and

a multiplexer having a plurality of multiplexer inputs each connected to a corresponding one of the plurality of context parameter register outputs, for selecting a current context parameter set for transmission to a multiplexer output;

b) a context identification register connected to the context register bank, for storing a current context identification token identifying a current context for the context register bank, wherein the context identification register is connected to a select line of the multiplexer, for controlling the multiplexer to select the

31 current context parameter set for transmission;  
32 and  
33 the context identification register is connected to  
34 a load enable line of each of the context  
35 parameter registers, for enabling an updating  
36 of a current context parameter set in a  
37 corresponding context parameter register; and  
38 c) logic connected to the multiplexer output for  
39 receiving the current context parameter set and  
40 processing a set of data tokens according to the  
41 current context parameter set, connected to the  
42 input connection of the context parameter registers  
43 for providing updated context parameter sets to the  
44 context parameter registers, and connected to the  
45 context identification register for propagating the  
46 current context identification token through the  
47 multi-context storage unit.  
48

1 2. The system of claim 1, further comprising logic for  
2 controlling a flow of the set of data tokens through  
3 the cores such that each data token is transferred from  
4 a first core to a second core upon a synchronous  
5 assertion of a request signal from the second core to  
6 the first core, and of a ready signal from the first  
7 core to the second core.  
8

1 3. The system of claim 1, wherein an interface of a core  
2 includes a content specification flag for indicating  
3 whether a token containing the flag is a data token or  
4 a context identification token.  
5

1 4. The system of claim 1, wherein an interface of a core  
2 includes a dedicated context identification field for

transferring a current context identification token with each data token passing through the interface.

- 5.
- A data-flow and context-flow data processing system, comprising a plurality of data-driven cores including:
- a) logic for controlling a flow of data tokens and context identification tokens through the cores;
  - b) a plurality of distributed multi-context storage units, each multi-context storage unit including:
    - a context identification register for storing a context identification token identifying a current context of said each multi-context storage unit; and
    - a multi-context register bank for storing a plurality of context parameters corresponding to a plurality of contexts,wherein the context identification register is connected to the multi-context register bank for setting the multi-context register bank to the current context; and
  - c) logic for processing the data tokens according to a context parameter corresponding to the current context.

- 6.
- A data-flow and context-flow data processing system, comprising a plurality of data-driven cores, each of the cores including:
- a) a context identification storage unit for storing a current context identification token; and
  - b) logic for controlling a flow of the current context identification token through the cores such that the current context identification token is transferred from a first core to a second core upon a synchronous assertion of a request signal from the

second core to the first core, and of a ready signal from the first core to the second core.

7. A data- and context-flow processing method comprising the steps of:

- a) propagating a current context identification token through a plurality of data flow cores integrated on a chip, the current context identification token identifying a current context;
- b) retrieving a set of context parameters corresponding to the current context from each of a plurality of multi-context storage units distributed through the cores, as the current context identification token propagates through the multi-context storage units; and
- c) processing a set of data tokens in the current context, according to the set of context parameters.

8. A data- and context-flow data processing system comprising a first data- and context-flow core and a second data- and context-flow core integrated on a chip, the first core comprising:

- a) an input interface for receiving a data token and a context identification token from the second core, the context identification token identifying one of a plurality of contexts as a current context, wherein each token transfer between the second core and the first core occurs upon a synchronous assertion of a request signal from the first core to the second core and a ready signal from the second core to the first core;
- b) a context identification register connected to the input interface, for storing the context identification token;

- 17 c) a multi-context storage unit connected to the  
18 context identification register, for storing a  
19 plurality of context parameters corresponding to the  
20 plurality of contexts;  
21 d) control and processing logic connected to the  
22 context identification register and the context  
23 register bank, for

24 \ 9. A data- and context-flow data processing system  
1 comprising a plurality of cores, each of the cores  
2 comprising:  
3

- 4 a) an input control bus for transferring input control  
5 signals;  
6 b) an input token bus for receiving input tokens in  
7 response to assertions of the input control signals,  
8 the input tokens including  
9 an input data token to be processed by the core, and  
10 an input context identification token for specifying  
11 a current context;  
12 c) an output control bus for transferring output  
13 control signals; and  
14 d) an output token bus for sending output tokens in  
15 response to assertions of the output control  
16 signals, the output tokens including  
17 an output data token derived from the input data  
18 token, and  
19 an output context identification token equal to the  
20 input context identification token, for  
21 specifying the current context.  
22

1 \ 10. A multithreaded data processing system comprising a first  
2 data-driven core, a second data-driven core, and a third  
3 data-driven core integrated on a chip, the first core  
4 comprising:

- 5 a) a first input interface connected to the second  
6 core, comprising  
7 a first input request connection for asserting a  
8 first input request signal to the second core,  
9 a first input ready connection for receiving a first  
10 input ready signal asserted by the second core,  
11 and  
12 a first input data connection for receiving from the  
13 second core an input context token for  
14 establishing a context state for the first  
15 core;
- 16 b) processing logic connected to the first input  
17 interface, for processing a data token according to  
18 the context state;
- 19 c) a first output interface connected to the third  
20 core, comprising  
21 a first output request connection for receiving a  
22 first output request signal asserted by the  
23 third core,  
24 a first output ready connection for asserting a  
25 first output ready signal to the third core,  
26 and  
27 a first output data connection connected to the  
28 processing logic, for transmitting to the third  
29 core a first output context token derived from  
30 the first input token, for establishing the  
31 context state for the third core;
- 32 d) first input control logic connected to the first  
33 input interface, for controlling the first core to  
34 receive the first input context token if the first  
35 input request signal and the first input ready  
36 signal are asserted with a predetermined synchronous  
37 relationship; and

- 38 e) first output control logic connected to the first  
39 output interface, for controlling the first core to  
40 transmit the first output context token to the third  
41 core if the first output request signal and the  
42 first output ready signal are asserted with a  
43 predetermined synchronous relationship.  
44

1 11. The system of claim 10 wherein:

- 2 a) the first input control logic comprises logic for  
3 controlling the first core to receive the first  
4 input context token if the first input request  
5 signal and the first input ready signal are  
6 asserted synchronously; and  
7 b) the first output control logic comprises logic for  
8 controlling the first core to transmit the first  
9 output context token to the third core if the  
10 first output request signal and the first output  
11 ready signal are asserted synchronously.

1 12. The system of claim 11 wherein:

- 2 a) the first input control logic comprises logic  
3 for controlling the first core to receive the  
4 first input context token synchronously with  
5 the first input request signal and the input  
6 ready signal; and  
7 b) the first output control logic comprises logic  
8 for controlling the first core to transmit the  
9 first output context token synchronously with  
10 the first output request signal and the output  
11 ready signal.  
12

1 13. The system of claim 10 wherein:

- 2 a) the first core further comprises a second output  
3 interface connected to a fourth core integrated on  
4 the chip, the second output interface comprising  
5 a second output request connection for receiving a  
6 second output request signal asserted by the  
7 fourth core,  
8 a second output ready connection for asserting a  
9 second output ready signal to the fourth  
10 core, and  
11 a second output data connection connected to the  
12 data processing logic, for transmitting the  
13 output context token to the fourth core; and  
14 b) the first core further comprises second output  
15 control logic connected to the second output  
16 interface, for controlling the first core to  
17 transmit the output context token to the fourth  
18 core if the second output request signal and the  
19 second output ready signal are asserted  
20 synchronously.

21  
22 14. The system of claim 10, wherein the first core further  
23 comprises a multi-context storage unit connected to the  
24 processing logic, for storing a plurality of context  
25 parameters corresponding to a plurality of contexts.

26  
27 15. The system of claim 14 wherein the multi-context  
28 storage unit comprises:

- 29 a) a plurality of registers connected in parallel,  
30 for storing a plurality of context parameter  
31 values for a corresponding plurality of  
32 contexts; and  
33 b) a multiplexer connected to the outputs of the  
34 plurality of registers, for selecting for  
35 transmission a value of the context parameter



10 corresponding to a current context state for  
11 the multi-context storage unit.

12

1 \16. A multithreaded data processing system comprising a first  
2 data-driven core and a second data-driven core, the first  
3 core comprising an input interface connected to the  
4 second core, the input interface including:

- 5 a) an input request connection for asserting an input  
6 request signal to the second core;  
7 b) an input ready connection for receiving an input  
8 ready signal asserted by the second core; and  
9 c) an input data connection for receiving from the  
10 second core, upon a synchronous assertion of the  
11 input request signal and the input ready signal, a  
12 first input context identification token identifying  
13 a current context state.

14  
15 \17. A multithreaded data processing system comprising a first  
16 data-driven core, a second data-driven core, and a third  
17 data-driven core integrated on a chip, the first core  
comprising:

- 1 a) an input interface connected to the second core,  
2 comprising  
3 a control bus for transmitting a set of first  
4 control signals between the first core and the  
5 second core, and  
6 an input data bus for receiving from the second  
7 core, upon the assertion of the set of first  
8 control signals according to a predetermined  
9 protocol  
10 an input data token, and  
11 an input context identification token for  
12 establishing a current context state in  
13 the first core;

- 18           b)   processing logic connected to the first input  
19                interface, for generating an output data token from  
20                the input data token according to the context state;  
21                and  
22           c)   an output interface connected to the third core,  
23                comprising  
24                an output control bus for transmitting a set of  
25                second control signals between the first core  
26                and the third core, and  
27                an output data bus connected to the processing  
28                logic, for transmitting to the third core, upon  
29                the assertion of the set of first control  
30                signals according to the predetermined protocol  
31                the first output token, and  
32                a first output context token derived from the  
33                first input token, for establishing the  
34                current context state in the third core.  
35

18. A data- and context-flow data processing method comprising  
the steps of:

- a)   establishing a first data- and context-driven core  
and a second data- and context-driven core, the  
second core being connected to the first core for  
receiving data tokens and context tokens from the  
first core; and  
b)   operating the first core in a first context, and  
concurrently, operating the second core in a second  
context different from the first context.

19. A data- and context-flow processing method comprising the  
steps of:

- a)   establishing a data- and context-driven core  
comprising a plurality of interconnected pipestages,  
the pipestages including

6 logic for controlling a flow of data tokens and  
7 context identification tokens therethrough, and  
8 a plurality of distributed multi-context storage  
9 units each storing a plurality of context  
10 parameters and each responsive to the context  
11 identification tokens; and

- 12 b) operating a first set of pipestages in a first  
13 context specified by a first context identification  
14 token present within the first set of pipestages, and  
15 concurrently, operating a second set of pipestages in  
16 a second context specified by a second context  
17 identification token present within the second set of  
18 pipestages.  
19